

What is claimed is:

1. A target detection apparatus comprising:
  - an optical irradiation unit which irradiates light,
  - an optical interference unit which can interact with a detection target, interferes with the light irradiated from the optical irradiation unit and radiates it as interference light, and is able to vary the wavelength of the interference light after interaction with the detection target, and
  - a wavelength change detecting unit placed in the path of the interference light which detects the wavelength variation of the interference light radiated by the optical interference unit.
2. A target detection apparatus according to Claim 1, wherein the wavelength change detecting unit transmits light of a specific wavelength, and can detect that light of the specific wavelength has been passed through.
3. A target detection apparatus according to Claim 2, wherein the wavelength change detecting unit comprises an interference filter, and an optical detection sensor which can detect light which has passed through the interference filter.
4. A target detection apparatus according to Claim 1, wherein the wavelength change detecting unit measures a spectrum before

wavelength change of the interference light and a spectrum after wavelength change of the interference light, and can measure their differential spectrum.

5. A target detection apparatus according to Claim 4, wherein the wavelength change detecting unit transforms the differential spectrum into a spectral intensity, and can amplify the spectral intensity.

6. A target detection apparatus according to Claim 4, wherein the wavelength change detecting unit is a spectrophotometer.

7. A target detection apparatus according to Claim 1, wherein the optical interference unit radiates interference light at least one selected from a reflected light and a transmitted light.

8. A target detection apparatus according to Claim 1, wherein the optical interference unit comprises a film-like material.

9. A target detection apparatus according to Claim 8, wherein the optical interference unit further comprises a substrate, and the film-like material is provided on the substrate.

10. A target detection apparatus according to Claim 8, wherein the film-like material comprises a rod-shaped material.

11. A target detection apparatus according to Claim 10, wherein the film-like material is formed by a coating method.
12. A target detection apparatus according to Claim 9, wherein the substrate is formed from at least one of semiconductor, ceramics, metal, glass, and plastics.
13. A target detection apparatus according to Claim 9, wherein the substrate comprises on a surface thereof an identical refractive index film having substantially the same refractive index to a refractive index of the film-like material.
14. A target detection apparatus according to Claim 9, wherein the substrate comprises on a surface thereof a different refractive index film having a different refractive index from the refractive index of the film-like material.
15. A target detection apparatus according to Claim 14, wherein the refractive index of the different refractive index film is different from a refractive index of the substrate.
16. A target detection apparatus according to Claim 14, comprising a plurality of different refractive index films, refractive indices of the plurality of different refractive index films being mutually different.

17. A target detection apparatus according to Claim 14, wherein the different refractive index film is a dielectric film.

18. A target detection apparatus according to Claim 9, wherein the substrate is an interference filter.

19. A target detection apparatus according to Claim 8, wherein at least one film is further formed on the surface of the film-like material.

20. A target detection apparatus according to Claim 19, wherein the film has a refractive index substantially the same to the refractive index of the substrate surface in contact with the film-like material.

21. A target detection apparatus according to Claim 8, wherein the thickness of the film-like material is 50nm to 1 $\mu$ m.

22. A target detection apparatus according to Claim 8, wherein the film-like material is one of a monomolecular layer of a rod-shaped material and a laminated film of the monomolecular layers.

23. A target detection apparatus according to Claim 10, wherein the rod-shaped material is a rod-shaped organic molecule.

24. A target detection apparatus according to Claim 23, wherein the rod-shaped organic molecule is a helical molecule.

25. A target detection apparatus according to Claim 24, wherein the helical molecule is an  $\alpha$ -helix polypeptide.

26. A target detection apparatus according to Claim 10, wherein the rod-shaped material has a target interaction part which can interact with the detection target.

27. A target detection apparatus according to Claim 26, wherein the target detection part can interact with the detection target by at least one selected from physical adsorption and chemical adsorption.

28. A target detection apparatus according to Claim 26, wherein the target detection part is a target capturing body which can capture the detection target.

29. A target detection apparatus according to Claim 28, wherein the target capturing body is at least one selected from enzyme, coenzyme, enzyme substrate, enzyme inhibitor, a clathrate compound, metal, antibody, antigen, protein, microorganism, virus, cell debris, metabolic product, nucleic acid, hormone, hormone

receptor, lectin, sugar, physiologically active substance and physiologically active substance-receptor.

30. A target detection apparatus according to Claim 29, wherein:

the clathrate compound is selected from a monomolecular host compound, a polymolecular host compound, a polymer host compound, and an inorganic host compound;

the monomolecular host compound is selected from cyclodextrin, a crown compound, cyclophane, azacyclophane, calixarene, cyclotrimeratrylene, spherand, cavitand and, cyclic oligopeptide;

the polymolecular host compound is selected from urea, thiourea, deoxycholic acid, perhydrotriphenylene, and tri-o-thymotide;

the polymer host compound is selected from cellulose, starch, chitin, chitosan, and polyvinyl alcohol; and

the inorganic host compound is selected from an interlayer compound, zeolite, and a Hofmann complex.

31. A target detection apparatus according to Claim 28, wherein the detection target is avidin, and the target capturing body is biotin.

32. A target detection apparatus according to Claim 1, wherein the optical irradiation unit can irradiate a pencil light beam.

33. A target detection apparatus according to Claim 1, wherein the optical irradiation unit is a laser irradiation device.

34. A target detection substrate comprising:  
a film-like material; and  
a substrate, wherein the film-like material is provided on the substrate, and the substrate can interact with a detection target, interfere with irradiated light and radiate it as interference light, and change the wavelength of the interference light after interacting with the detection target.

35. A target detection substrate according to Claim 34, wherein the interaction is at least one selected from physical adsorption and chemical adsorption.

36. A target detection substrate according to Claim 34, wherein the interference light is radiated as at least one of reflected light and transmitted light.

37. A target detection substrate according to Claim 34, wherein the film-like material is formed of a rod-shaped material.

38. A target detection substrate according to Claim 34, wherein the substrate is formed from at least one of semiconductor, ceramics,

metal, glass, and plastics.

39. A target detection substrate according to Claim 34, wherein the substrate comprises on a surface thereof an identical refractive index film having substantially the same refractive index to a refractive index of the film-like material.

40. A target detection substrate according to Claim 34, wherein the substrate comprises on a surface thereof a different refractive index film having a different refractive index from the refractive index of the film-like material.

41. A target detection substrate according to Claim 40, wherein the refractive index of the different refractive index film is different from a refractive index of the substrate.

42. A target detection substrate according to Claim 40, comprising a plurality of different refractive index films, refractive indices of the plurality of different refractive index films being mutually different.

43. A target detection substrate according to Claim 40, wherein the different refractive index film is a dielectric film.

44. A target detection substrate according to Claim 34, wherein the substrate is an interference filter.



45. A target detection substrate according to Claim 34, wherein at least one dielectric film is further formed on the surface of the film-like material.

46. A target detection substrate according to Claim 34, wherein the thickness of the film-like material is 50nm to 1 $\mu$ m.

47. A target detection substrate according to Claim 34, wherein the film-like material is one of a monomolecular layer of a rod-shaped material and a laminated film of the monomolecular layers.

48. A target detection substrate according to Claim 47, wherein the rod-shaped material is a rod-shaped organic molecule.

49. A target detection substrate according to Claim 48, wherein the rod-shaped organic molecule is a helical molecule.

50. A target detection substrate according to Claim 49, wherein the helical molecule is an  $\alpha$ -helix polypeptide.

51. A target detection method comprising the steps of:  
irradiating light to an optical interference unit which can interact with a detection target, and radiate the light as interference light; and

detecting a wavelength change of the interference light.

52. A target detection method according to Claim 51, wherein the optical interference unit can change the wavelength of the interference light after interaction with the detection target.

53. A target detection method according to Claim 51, wherein the optical interference unit is a target detection substrate formed from a film-like material on a substrate, can interact with a detection target, interferes with irradiated light and radiates it as interference light, and can change the wavelength of the interference light after interaction with the detection target.